Introduction

I. Purpose of Environment Indicators

The Key Outcomes of the Countywide Planning Policies' (CPP's) environmental policies are to:

- Protect and enhance natural ecosystems that support the diversity of plants and wildlife,
- Improve air quality
- Protect water quantity and quality, and
- Use non-renewable energy resources with restraint

The following twelve indicators for the environment were chosen because they represent many of the critical environmental issues facing King County today. The presence of a healthy and intact environment is an asset to this region. A productive economy and a high quality of life are inseparably linked to the natural environment.

The purpose of establishing indicators for the environment is to evaluate progress toward the goals and outcomes outlined in the Countywide Planning Policies. With the help of these environmental indicators the Growth Management Planning Council will be able to evaluate the effectiveness of the Countywide Planning Policies, monitor trends and recognize successes and potential shortfalls.

II. Definitions

Definitions are given along with the notes for each Indicator, since there are very few terms common to more than one of the environmental indicators.

Outcome: Protect and Enhance Natural Ecosystems

INDICATOR 9: Land cover changes in urban and rural areas over time.

Fig. 9.1

Percent of County Land Area That Was Developed: 1984, 1991, 1998.			
Counties	**1984**	**1991**	**1998**
King	**10.4%**	**11.6%**	**13.2%**
Pierce	7.3%	8.6%	13.2%
Snohomish	3.3%	4.0%	8.1%
Kitsap	6.9%	8.8%	NA
4 County Area	7.0%	8.1%	NA

Definitions and Notes

1. ***Developed land*** *is made up of land in both urban and rural areas that has been converted from vegetative cover. It includes paved areas and buildings, small residential lawns, and shrubs, but it excludes wetlands, larger parks, and open spaces in urban and suburban areas.*
2. *These percentages are based on an analysis of* ***Landsat (satellite) image data****. Earlier Landsat images were recorded and analyzed in 1984 and 1991. The most recently processed image was recorded in August 1998. There are a number of limitations to this type of data:*
   - *The method of analyzying Landsat data was less refined with the earlier datasets, making comparison of these three "snapshots" imprecise at best.*
   - *The nature of this methodology makes the result hard to compare to other methods of calculating developed areas – e.g. on-the-ground surveys or building permit data.*
   - *The units of measurement are relatively large. Each "cell" is approximately 1/5 of an acre in size (about ¼ of a football field), and is assigned a single land cover value, based on the predominant land use in that cell.*
   - *Landsat analysis is not always able to distinguish between natural land cover and landscaped subdivisions, which are considered a developed, urban use. On the other hand, extensive natural rock surfaces, such as those found in unforested mountain areas, show up as "developed area" because of their similarity to concrete and paved surfaces.*
3. *On the balance, however, the estimate of total developed area should be reasonably accurate.*

About This Indicator

- Based on Landsat data, King County's developed area has increased from 10.4% in 1984, to 11.6% in 1991, to 13.2% in 1998.
- The accompanying land cover map shows that by far the greatest proportion of development in King County has remained within the Urban Growth Boundary.
- Vegetative cover, especially forest, performs significant ecological functions. Forests and other types of vegetation, absorb, filter, and slow surface water flow. They provide wildlife habitat, clean air, and are aesthetically pleasing. Fish and wildlife depend upon continuous, undisturbed habitat. When ecosystems become highly fragmented, fish and wildlife are prevented from meeting their need for food, water, cover, and space.
- When the land in a watershed reaches 10-15 percent impervious surface (paved or built land cover not permeable by water) the area undergoes long-term, and probably irreversible, loss of aquatic system functions. This loss results in larger and more frequent high flows, decreased base flows to streams, and increased water level fluctuation in wetlands and small lakes. Changes in flows have significant adverse impacts on plants, fish, and wildlife.

For Comparison

- Based on the latest data, Pierce County has 13.2% developed area, almost exactly the same as King County.
- Snohomish County has 8.1% of its land area developed. Of the three counties, Snohomish has the smallest proportion of its total land developed, but development has proceeded rapidly since 1980.
- No new data is available for this indicator this year. A 2000 Landsat image was flawed by occasional cloud cover. A new Landsat image will be analyzed in 2001-2002, providing better comparison over time.

Data Sources: King County Surface Water Management Department, 1996*; Remote Sensing Project Land Cover and Change Detection*, Puget Sound Regional Council, April 1994. 1998 Landsat data was obtained from the interdepartmental PRISM project at the University of Washington, and processed under its direction.

Policy Rationale: The policy rationale stems from Countywide Planning Policies FW-4, FW-5, CA-4, CA-7, CA-8 and CA-9.

See 1998 Development and Land Cover in the Tri-County Region Map at:

http://www.metrokc.gov/exec/orpp/benchmrk/bench01/01lndcvr_chngs.pdf

See 1998 Development and Land Cover in the Tri-County Region Map at:

http://www.metrokc.gov/exec/orpp/benchmrk/bench01/01lndcvr_chngs.pdf

Outcome: Improve Air Quality

INDICATOR 10: Air quality.

Fig. 10.1

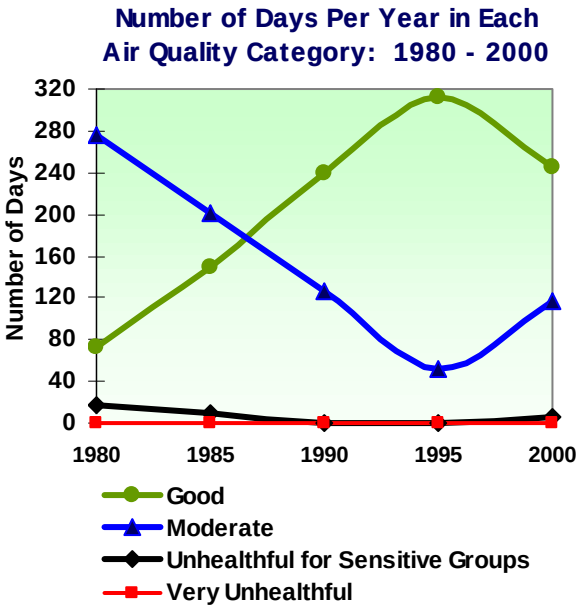

Fig. 10.2

Number of Days in Each Air Quality Category by Year

	1980	1985	1990	1995	2000
Good	73	150	239	313	245
Moderate	275	202	126	52	116
Unhealthful for Sensitive Groups	18	10	0	0	5
Very Unhealthful	0	0	0	0	0

Definitions and Notes:

1. *The Pollutant Standards Index (PSI) provides a nationally uniform method to report daily air quality levels. The PSI reflects the maximum levels of four key pollutants: carbon monoxide, suspended particulate matter (dust, soot, other particles 10 micrometers or less in diameter), sulfur dioxide and ozone. The concentration of each pollutant on a given day determines an Index value and the pollutant with the highest Index value determines the PSI on that day. These are then translated in "good", "moderate", and "unhealthful" categories.*

About This Indicator

- The number of good air quality days increased from 73 in 1980 to 343 in 1998. The decline to 272 good days in 1999 and 245 good days in 2000 reflects a higher federal standard for particulate matter adopted by the Seattle area beginning last year. This also accounts for the rise in the number of "moderate" days, and for the five days designated as unhealthy for sensitive groups.
- There are three major types of air pollutants: fine particles or "particulate matter"; ozone or "smog", and toxic emissions such as carbon monoxide and sulfur dioxide.
- Particulate matter in the air has been associated with an increasing risk of respiratory illness, especially serious asthma attacks (as measured by asthma hospitalizations). Even a small rise in PM concentrations in the air, below the new National Air Quality Standard of 15 micrograms per cubic meter, appears to lead to increased asthma attacks.
- Asthmas is a chronic disease whose causes are largely unknown, but genetic predisposition and environmental triggers in both indoor and outdoor air are known contributors to asthma's development and severity.
- New cases of asthma are increasing rapidly, with victims projected to double to 29 million individuals by 2020. It disproportionately affects the very young, the very old, and the very poor, and it is the leading cause of school absenteeism. (See Figure 10.3)
- King County has been the site of major research studies on the affects of fine particle air pollution on childhood asthma. As Fig. 10.4 indicates, the hospitalization rate for children in Seattle's inner city was more than 600 per 100,000, while it was 100 per 100,000 for suburban children.
- A recent study in Boston found that a high level of particulate matter in the air was associated with an increased incidence of heart attack among at-risk individuals.

INDICATOR 10:

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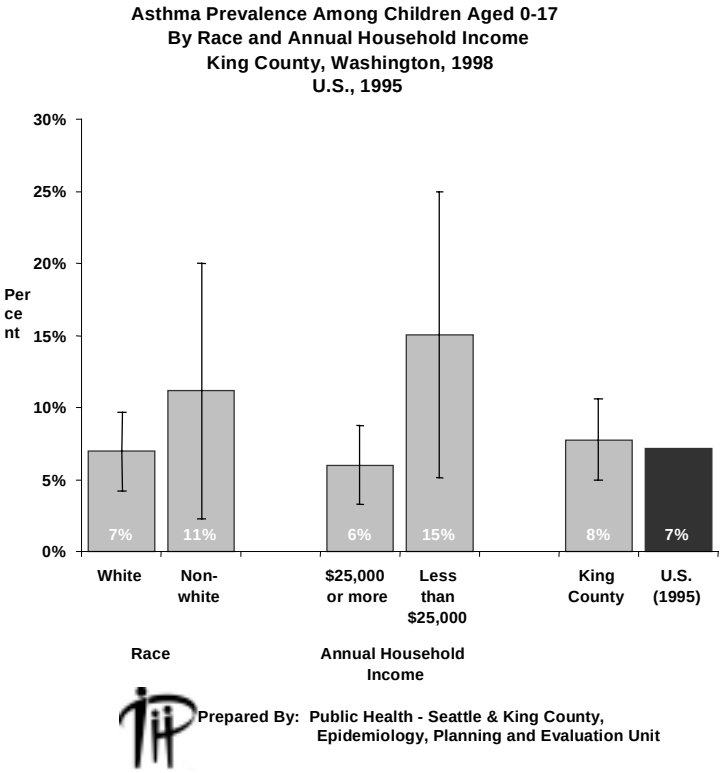
Fig. 10.3



- Ozone also impairs the normal functioning of the lungs for young children and for those with respiratory ailments, and it reduces the ability of plants to breathe. It can rise to unhealthy levels, especially on hot summer days, and it contributes to global warming.
- Motor vehicles are by far the largest contributors to overall air pollution with 55% of the total, followed by industry with 21%, outdoor burning with 12%, and wood stoves and fireplaces with 12%. Outdoor burning, wood stoves and fireplaces contribute to the amount of particulate matter in the air. Small engines such as gas-powered lawnmowers, along with most vehicles, contribute to ozone in the air.
- Many factors including increased fuel efficiency, higher emission standards and improved regulatory enforcement have contributed to long-term improvements in air quality.

For Comparison

- While King County received a barely passing grade for ozone levels, its air is cleaner than the 333 counties out of 382 which received failing grades from the American Lung Association.
- Based on 1996 air samples, King County was ranked among the worst 5% of U.S. counties for airborne toxins. For instance, King County ranked high in levels of benzene, a known carcinogen which is found in gasoline.

What We Are Doing

- Encouraging transit ridership, creating bicycle trails, promoting pedestrian-friendly urban design, and increasing availability of alternative transportation.
- Maintaining bans on outdoor burning and use of wood stoves when conditions warrant.
- Providing public education on ways to maintain and improve air quality.
- Reducing diesel emissions through Diesel Solutions, a public/private program that will accelerate the introduction of low sulfur fuels into Western Washington.
- Promoting use of more efficient or alternative-fueled vehicles in buses and other fleet vehicles and equipment. Encouraging use of more fuel-efficient private vehicles.
- Promoting proximity of housing and jobs in order to reduce commute distances.

Data Source*:* Puget Sound Air Pollution Control Agency*;* Jane Koenig, Ph.D., U. W. Dept. of Environmental Health; Seattle-King County Dept. of Public Health; American Lung Association; Seattle Times.

Policy Rationale: The policy rationale stems from Countywide Planning Policies FW-4 and CA-14. This Indicator focuses on maintaining air quality sufficient for public health.

Outcome: Improve Air Quality

INDICATOR 11: Energy consumption.

Fig. 11.1

Per Capita Energy Consumption in Millions of BTUs Per Year: 1986 - 2000

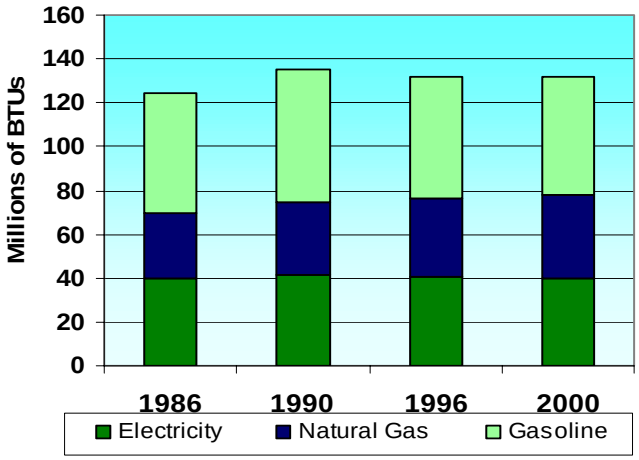


Fig. 11.2

Energy Consumption in Million BTU's per Capita by Energy Type: 1986 - 2000					
	1986	1990	1995	2000	% Chg 1986-2000
Electricity	39.6	41.2	39.5	39.9	1%
Natural Gas	30.0	33.5	32.8	37.9	23%
Gasoline	54.4	60.3	55.0	54.4	0%
Diesel Fuel				14.1	
Total Per Capita Energy Consumption	124.0	135.0	128.3	132.2	6%

Definitions and Notes:

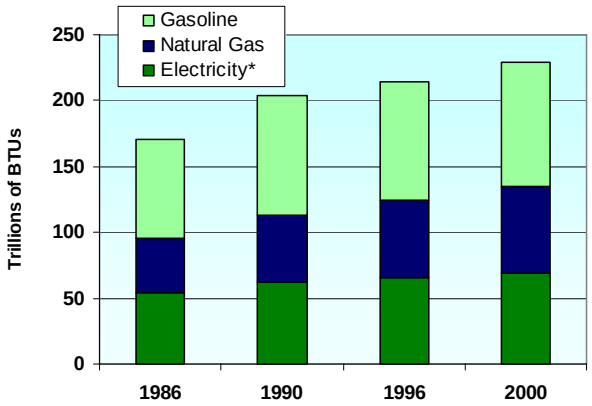
1. *BTU=British Thermal Unit. 3.413 Million BTU = 1 MegaWattHour*
2. *Electricity includes both Seattle City Light and Puget Sound Energy consumption. Diesel fuel data was only collected for 1996 - 2000, so it is not included in the Total Per Capita for any year, or on Fig. 11.3.*
3. *Figures presented for electricity and natural gas include consumption in all sectors: residential, commercial, industrial, and government (street lights, etc). They do not include self-consumed, line loss or unbilled power. Numbers from Puget Sound Energy from 1999 are preliminary, and will be revised next year.*
4. *The electricity comes from both non-renewable and renewable sources, the former include energy derived from coal, oil, gas and nuclear power plants and the latter from hydroelectric plants.*
5. *Electricity supplied by Puget Power and Seattle City Light is generated in part in Washington State and in part, in other states, and in Canada and Mexico. Electricity generated outside King County, if it is derived from coal or oil power plants, affects air quality in those areas and not within the county. Electricity generated in hydropower plants impacts streams and watersheds, but does not affect air quality.*
6. *50% of the natural gas supplied by Washington Natural Gas is derived from domestic sources and 50% from Canadian sources.*

About This Indicator

- Per capita consumption of all energy sources has increased 6.1% since 1986. However, it has declined 2.1% from a high in 1990. This total does not include diesel fuel, which has only been tracked since 1996.
- Natural gas accounts for an increasing share of residential energy consumption, while per capita use of electricity has stabilized. It is likely that natural gas is replacing electricity or other energy sources for some residential uses. Industrial consumption of natural gas fell 42% from 1993 - 1997.
- Per capita usage of automotive gasoline has fluctuated throughout this 15 year period, but it is currently at the same level as it was in 1986. More efficient vehicles probably account for most of this stabilization.
- Total energy consumption has increased 35% since 1986 due primarily to population growth and economic growth, but also to some increases in per capita consumption.

Fig.11.3

Total Energy Consumption Per Year in Trillions of BTUs: 1986 - 2000



INDICATOR 11:

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- Total consumption of diesel fuel has risen a sharp 35% since 1996 when tracking of its usage began. According to the Washington State Dept. of Transportation, this rise is due to an increase in commercial traffic.
- All energy providers have been actively promoting energy conservation since the 1980s. Some have installed thermal insulation in residences and promoted energy efficient appliances.

What We Are Doing

- Reducing levels of heating and air conditioning in County buildings; turning off lights and computers.
- Educating consumers on ways to conserve on household energy; providing sample compact fluorescent bulbs to replace incandescent bulbs.
- Reducing gasoline consumption by encouraging alternatives to single-occupancy vehicles, such as buses, vanpools, carpools, bicycling, and walking.
- Encouraging energy-efficiency in new non-residential buildings through incentives and regulations.

Data Sources: Seattle City Light; Puget Sound Energy (formerly Puget Power); Washington Natural Gas; and Washington State Department of Transportation.

Policy Rationale: The policy rationale stems from Countywide Planning Policies ED-11, CO-2, CO-3 and CO-6. Most uses of energy have direct and indirect environmental impacts, which can include deterioration of air quality, water quality and natural resources. Public health can also be negatively impacted as a result of energy production and use. Energy conservation is critical for the protection of the region's environment and to postpone the need for the construction of new and expensive energy-producing facilities.

Outcome: Improve Air Quality

INDICATOR 12: Vehicle miles traveled (VMT) per year.

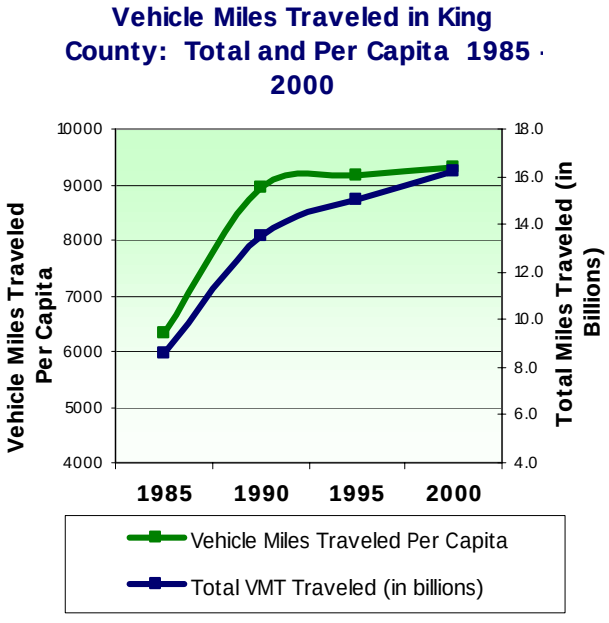
Fig.12.1

Vehicle Miles Traveled: Per Capita and Total				
Year	**1985**	**1990**	**1995**	**2000**
Vehicle Miles Traveled Per Capita	6344	8933	9154	9322
Total VMT Traveled (in billions)	8.6	13.5	15.0	16.2

Definitions and Notes:

1. *Vehicle Miles Traveled (VMT) is a measure of the total miles traveled by all vehicles on the road in a given year for a given period of time. Vehicle Miles Traveled per Year is based on approximate total miles traveled as reported in the "Highway Performance Monitoring Report", (HPMS) Washington State Department of Transportation. HPMS is not designed for use at the local jurisdictional level, but rather for use in determining the needs for roadways at the State level. When aggregated at the county level, the figures may overstate the increase in VMT.*
2. *Per Capita VMT means the total VMT divided by the number of King County residents. Figs. 12.1 and 12.2 use a corrected population estimate for 1995.*
3. *Many of the total VMT are actually driven by non-residents of King County, including commuters from neighboring counties, commercial vehicles originating outside the County, or tourists passing through. These non-resident groups may not normally purchase gas within the County.*

Fig.12.2



INDICATOR 12:

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About This Indicator

- Vehicle Miles Traveled Per Capita in King County has risen just 4.4% from 1990 to 2000, after a rise of about 41% in the five years from 1985 to 1990.
- Total vehicle miles traveled on County roads, however, has risen 20% since 1990, after rising 92% from 1985 to 1990.
- While the slower rate of growth in VMT is welcome, the continuing rise in the total number of miles traveled poses serious threats to air quality in this region.
- VMT includes travel by commercial and public vehicles as well as private automobiles. The increase in per capita VMT is caused by a combination of factors, including
  - growth in population,
  - growth in County employment (at a rate considerably higher than population growth),
  - increased travel to King County job centers by residents of adjacent counties,
  - increased propensity to travel, and
  - more commercial traffic.
- The result has been more vehicles on the road, traveling many more total miles, and somewhat more per capita.
- Fuel consumption and gas tax collection are only partially correlated with VMT. Per capita gasoline consumption is about the same in King County in 2000 as it was in 1986. Diesel fuel usage, however, is up strongly.
- Fuel efficiency on some vehicles has increased during the 1985 to 2000 time period, meaning that it is possible to drive more miles with no more fuel being consumed. With this greater fuel efficiency, the increase in fuel consumed has been less than the increase in miles traveled. It is still unclear whether the recent popularity of larger, less fuel-efficient vehicles is affecting fuel consumption per mile and per capita.
- Motor vehicles are the major source of carbon monoxide and hydrocarbon air pollutants, as well as particulate matter and the carcinogen, benzene. The primary contributor to air pollution in the County, by a large margin, is the single occupancy vehicle. Lessening SOV travel, as measured by reductions in VMT, is essential for protecting the environment of our region.

What We Are Doing

King County has multiple approaches designed to lower the level of vehicle traffic. They include everything from housing strategies to bike paths. Some of the current initiatives include:

- Allowing higher density residential uses in cities and urban centers so that workers can live closer to their jobs. For instance, raising building height limits in the Denny Triangle area of Seattle will generate residential opportunities close to downtown, and also provide support for affordable housing in that area.
- Targeting urban centers to receive at least 50% of the new jobs in the County, so that these jobs remain close to population centers and accessible by public transportation.
- Continuing to provide high quality, affordable public transit, and to expand this through support of new rail, light rail and express bus services.
- Providing incentives for carpooling and vanpooling.
- Creating transit-oriented development through public/private partnerships. This will result in affordable residential opportunities close to transit centers.
- Working to maintain adequate, affordable ferry service with connections to public transport on land.
- Creating and maintaining bicycle paths throughout the County that serve commuters as well as recreational purposes.

Data Source: *Highway Performance Monitoring Reports 1981-2000*, Washington State Department of Transportation.

Policy Rationale: The policy rationale stems from Countywide Planning Policies T-8, CA-14 and CA-15. VMT is a general measure of travel demand that is used for both air quality management and Transportation Demand Management.

Outcome: Protect Water Quality and Quantity

INDICATOR 13: Surface water quality.

A. King County Lakes

Fig. 13.1

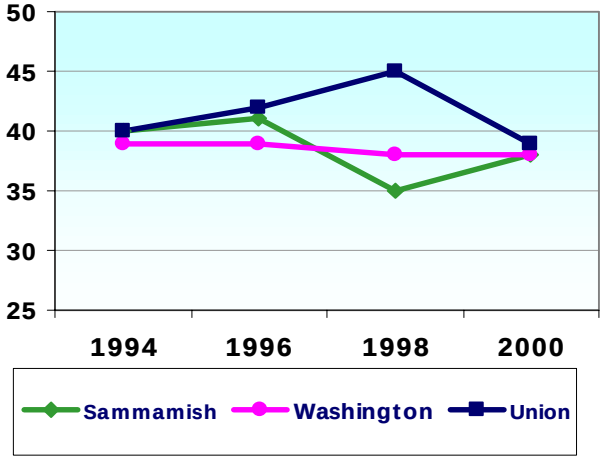

Fig. 13.2

Major King County Lakes					
Lake	Average Summer Trophic Index Values				Classification
	1994	1996	1998	2000	
Sammamish	40	41	35	38	Oligotrophic - Good Water Clarity
Washington	39	39	38	38	Oligotrophic - Good Water Clarity
Union	40	42	45	39	Mesotrophic - Moderate to Good Water Clarity

Definitions and Notes:

1. *Eutrophication refers to the biological activity in a lake, reflecting the natural aging process. Lakes age over time and gradually fill in, becoming ponds, marshes, wetlands and eventually forests. Measuring lake eutrophication is one of the most common ways to assess lake health.*
2. *Carson's (1977) trophic state index (TSI) is a method of quantifying this eutrophication on a scale of 0 - 100. The index integrates secchi depth (water clarity indicator), total phosphorus (nutrient indicator), and chorophyll a (algae indicator) measurements into a single value.*
3. *Lakes with values around 40 or less (oligotrophic) have high water clarity, lower algae values, and lower total phosphorus values.*
4. *Lakes with TSI values between 40 and 50 (mesotrophic) have moderate water clarity, algae and phosphorus values.*
5. *Lakes represented by TSI values between 50 and 60 (eutrophic) typically have poorer summer water quality including lower water clarity, higher chlorophyll a values and higher total phosphorus values.*
6. *Hypereutrophic lakes have TSI values greater than 60 and are very biologically productive. They have wetland-type attributes.*
7. *The TSI values are a continuum and hence some lakes may be in a borderline range, exhibiting some qualities of upper and lower classifications.*

About This Indicator

- Factors that influence water quality vary significantly from lake to lake. Generally it is more useful to look at changes in a lake's water quality over time to assess the health of the lake. Comparing water quality among a group of lakes is also a useful evaluation method.
- **Lake Union** is unique among the three major lakes in the County in the character of its watershed due to the Fremont and Montlake cuts and the Hiram M. Chittenden Locks. In the past the lake has received sanitary discharges from houseboats and ships, industrial discharge from businesses along the shore, and fuel spills and discharges from ships and onshore facilities.
- The intrusion of salt water from the Ship Canal results in stratified lake conditions, limiting the amount of habitat available to fish. The lake and canal system are the only migration route for the salmonids in the Lake Washington, Cedar River, and Lake Sammamish drainages.
- Lake Union has historically been characterized as having moderate water clarity and quality. The trophic state index measures for Lake Union were generally better in 2000 than in other years (see Figs. 13.1 and 13.2). The average TSI is relatively low (39), placing the lake in the category of moderate to low productivity, or moderate to good water quality.
- **Lake Sammamish** has historically suffered from excess phosphorus loading with frequent algae blooms. In 1968 municipal wastewater discharge into the lake was diverted, and conditions improved. However, extensive development and loss of forest cover in the watershed in the last 20 years have led to

INDICATOR 13:

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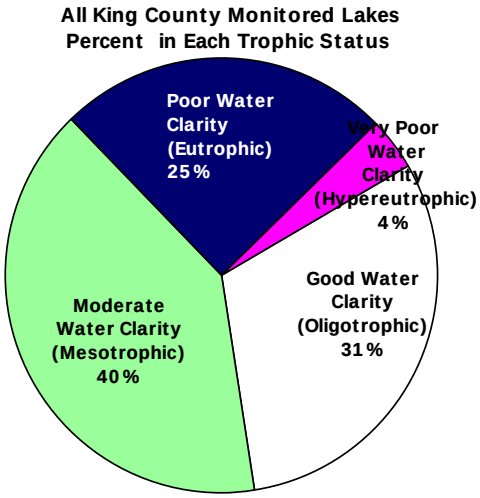
increasing discharge of both nutrients and chemical contaminants. The average TSI rating of 38 for 2000 was slightly better than the past few years, earning it a rating of moderate to good clarity and quality.

- **Lake Washington** is about twice as deep as Lake Sammamish, four times the area, and flushes about as frequently. Since the 1960's water quality improvements in Lake Washington have been much more dramatic than improvements observed in Lake Sammamish.
- The TSI values in Lake Washington for the past 7 years have averaged around 38 –39, placing it in the good water quality range.
- There are 49 **smaller lakes** that are monitored for trophic status. The trophic status for each of the small lakes is shown in Fig. 13.4. Two lakes, Allen and Panther-Kent are classified as hypereutrophic, having the lowest water clarity. Fig. 13.3 shows the proportion of all lakes in each trophic status.

Fig. 13.3



What We Are Doing

- Addressing the overflow of sewers into Lake Union through a Combined Sewer Overflow Control Program.
- Continuing to monitor lake water quality to track changes due to storm sewer overflow events, system breakdowns, or shoreline activities.
- Tracking and mitigating development activities that may affect lake and stream water quality.

Fig. 13.4

Condition of King County Small Lakes

Lake	1996	1997	1998	1999	2000	5-Year Avg.	Trophic Classification
Alice	--	--	--	--	39	**39**	Oligotrophic
Ames	--	--	--	--	39	**39**	Oligotrophic
Angle	--	35	35	37	36	**36**	Oligotrophic
Joy	--	--	--	--	38	**38**	Oligotrophic
Lucerne	38	39	34	40	39	**38**	Oligotrophic
Margaret	--	--	--	--	38	**38**	Oligotrophic
Meridian	--	40	38	38	36	**38**	Oligotrophic
Pine	41	40	39	37	39	**39**	Oligotrophic
Pipe	40	38	36	39	38	**38**	Oligotrophic
Ravensdale	39	39	39	--	--	**39**	Oligotrophic
Retreat	37	39	34	32	31	**35**	Oligotrophic
Shady	41	40	36	36	37	**38**	Oligotrophic
Star	39	42	38	36	36	**38**	Oligotrophic
Walker	--	--	--	--	38	**38**	Oligotrophic
Beaver-2	46	45	45	45	42	**45**	Mesotrophic
Bitter	--	44	43	45	42	**43**	Mesotrophic
Boren	--	46	43	42	42	**43**	Mesotrophic
Burien	--	--	42	--	44	**43**	Mesotrophic
Geneva	42	41	40	40	40	**40**	Mesotrophic
Haller	--	46	43	43	44	**44**	Mesotrophic
Horseshoe	--	--	--	--	44	**44**	Mesotrophic
Kathleen	48	49	47	47	50	**48**	Mesotrophic
Leota	--	--	46	47	49	**47**	Mesotrophic
Mirror	--	46	45	46	44	**45**	Mesotrophic
Morton	42	41	40	40	39	**40**	Mesotrophic
Neilson	--	46	43	44	48	**45**	Mesotrophic
North	43	46	42	--	--	**44**	Mesotrophic
Sawyer	43	43	40	40	39	**41**	Mesotrophic
Shadow	--	44	44	--	44	**44**	Mesotrophic
Spring	44	46	43	43	43	**44**	Mesotrophic
Steel	43	44	43	42	40	**43**	Mesotrophic
Twelve	45	--	37	--	42	**41**	Mesotrophic
Welcome	52	48	47	48	46	**48**	Mesotrophic
Wilderness	40	43	40	42	41	**41**	Mesotrophic
Beaver-1	--	53	51	51	51	**51**	Eutrophic
Cottage	52	52	47	52	53	**51**	Eutrophic
Desire	56	54	50	54	53	**53**	Eutrophic
Dolloff	56	56	56	53	56	**55**	Eutrophic
Fivemile	53	52	51	50	50	**51**	Eutrophic
Francis	49	49	51	50	51	**50**	Eutrophic
Garrett	59	58	58	--	--	**58**	Eutrophic
Killarney	51	52	51	47	48	**50**	Eutrophic
Marcel	--	--	--	--	53	**53**	Eutrophic
McDonald	53	54	55	54	50	**53**	Eutrophic
Paradise	53	56	52	53	54	**53**	Eutrophic
Trout	51	54	51	51	51	**52**	Eutrophic
Webster	52	50	--	--	--	**51**	Eutrophic
Allen	63	62	63	67	60	**63**	Hypereutrophic
Panther	60	--	--	--	60	**60**	Hypereutrophic

INDICATOR 13:

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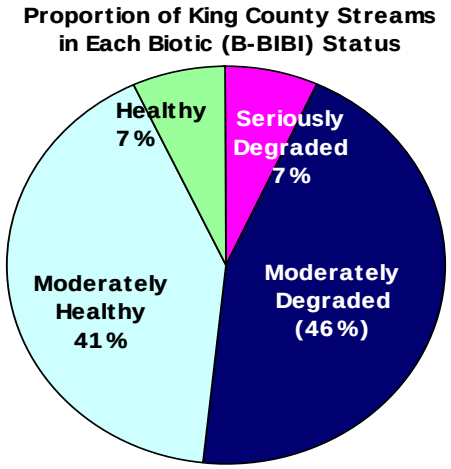
B. King County Streams

Fig. 13.5



Definitions and Notes

1. *The Benthic Index of Biotic Integrity (B-IBI) is a "report card" for the biological integrity of aquatic systems. Biological integrity is defined as "the ability to support and maintain a balanced, integrated, adaptive biological system having the full range of elements and processes expected in the natural habitat of a region".*
2. *The King County Water and Land Resources Division employs the B-IBI to determine the health of King County streams. The B-IBI measures the quantity of certain aquatic macro-invertebrates present in a stream sample. The number and condition of these macroinvertebrates yield 10 measures, each of which is assigned a score from 1 (severe degradation) to 5 (little or no degradation). The total score thus ranges from 10 (severe degradation by all measures) to 50 (little or no degradation by all measures).*
3. *B-IBI scores for streams in King County basins are given in the table below. The graph above shows the percent of King County streams judged to be in each category based on their B-IBI score. Streams with values in the 41 – 50 range are considered to be "healthy", in the 31 – 40 range they are called "moderately healthy", in the 21 – 30 range they are termed "moderately degraded", and in the 10 –20 range they are designated as "severely degraded".*

About This Indicator

- As the graph above illustrates, 53% of the monitored King County streams are designated seriously or moderately degraded based on the B-IBI score. Streams in the Snoqualmie Basin are not included in this monitoring effort.
- Average scores over several years from King County streams range from 14 (Little Soos Creek) to 45 (Lower Rock Creek and Black Nugget Creek). See Fig. 13.6 for scores of each stream.
- Since monitoring of these streams only began in 1994-1995, it is difficult to establish long-term trends. However, there appear to be notable differences in the biological integrity of the streams from one basin to the next.

Lake Sammamish/Issaquah Creek

- In the best condition are the tributaries of Issaquah Creek which feeds into the south end of Lake Sammamish. All but two of its tributaries are classified as moderately healthy or healthy.

Lake Washington/Cedar River

- The Cedar River flows into the south end of Lake Washington. Of its six monitored tributaries, Lower Rock Creek is classified as healthy, and Upper Rock Creek and Taylor Creek are classified as moderately healthy. Peterson Creek and Lower Walsh Creek are considered moderately degraded. The Cedar River and its tributaries contain much of the best remaining aquatic habitat in the Lake Washington system, although over half of the historic fish habitat has been lost or degraded.

Sammamish River Tributaries

- Bear Creek and Little Bear Creek flow into the Sammamish River, and from there into Lake Washington. Streams in these two basins are all moderately degraded. Water quality and fish habitat are in decline or threatened throughout the area. Many streams that supported substantial runs of salmonids one or two decades ago now support far fewer of these fish. The watershed contains a mix of land uses that include urban areas, agriculture, numerous parks, and forest production zones. Approximately 50% of the northern Lake Washington watershed is within the Urban Growth Boundary.

Green River/Soos Creek Basin

- Five out of eight monitored streams in the Middle Green River sub-basin are seriously to moderately degraded. While it is one of the largest remaining agricultural communities in King County, it is increasingly in demand as an affordable area for suburban and rural residences. Although the stream systems continue to support significant fish habitat, the urban designation of parts of these streams could lead to further degradation in water quality, stream flow, and habitat.